

ELECTRIC LOCOMOTIVES FOR THE GREAT NORTHERN.

The Great Northern recently had built by the American Locomotive Co., in conjunction with the General Electric Co., four electric locomotives for operating trains through the Cascade tunnel. These locomotives were built under the supervision of Dr. Cary T. Hutchinson, Consulting Engineer for the Great Northern.

Each of these locomotives has a total weight, in working order of 230,000 lbs., all of which is carried on the drivers. The locomotives are 44 ft. 2 in. long, over all, the driving wheels are 60 in. in diameter, and the rigid

The mechanical design represents a distinct departure from previous practice in electric locomotive construction, as it also represents the adaptability of steam locomotive practice to electric locomotive construction. The wheel arrangement, as seen in the illustrations, is a modification of the builder's practice in design of articulated steam locomotives to suit requirements of electric service. The locomotive is mounted on two four-wheel trucks, connected by a center pivot. This pivot is located in the center of the engine, midway between the inside axles of the two trucks. With this form of construction, the distance between the center pins supporting the cab platform varies as the trucks pass around curves. One

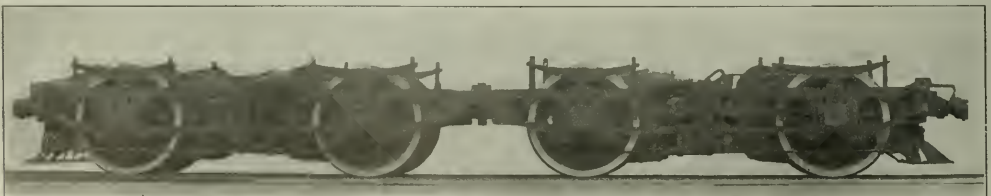


Electric Locomotive for the Great Northern.

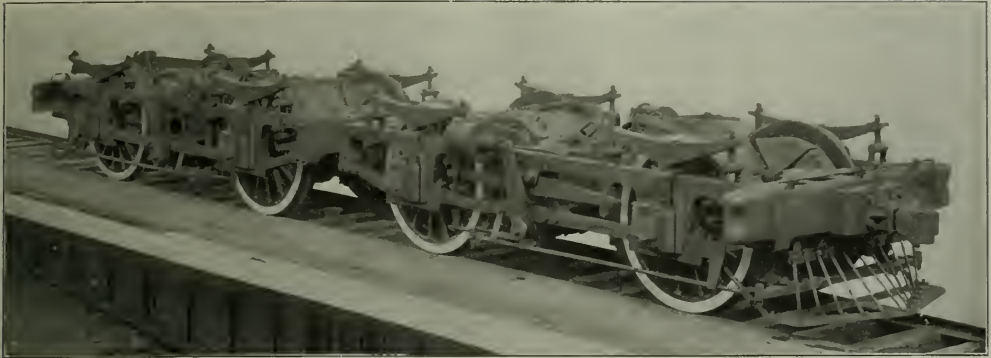
wheel base is 11 ft. Each truck is equipped with two three-phase induction type motors, which have plain secondary circuit rheostatic control and are capable of exerting a maximum torque of at least three times the guaranteed full load running torque at any speed to within 2 per cent. of synchronism. The motors are wound for 8 poles and when operated at 25 cycle have a synchronic speed of 375 r.p.m. On account of the large size of the geared motors, a special form of drive is used, there being pinions on each end of the motor shaft. These pinions engage gear bands shrunk on the extension of the driving wheel centers. The gear bands are cut in pairs and are set so that the teeth on the two wheels line up accurately. This form of drive prevents any tendency to tilt the motor, as in the case where the pinions are located on the end of the motor shaft. The gears do not have an excessive width of face, as the drive strain of each motor is divided between the two sets of gears of 1.4:2.8 ratio. An idea of the construction is given in the accompanying line drawing of the truck.

center pin, therefore, is designed to allow sufficient longitudinal movements to provide for this condition.

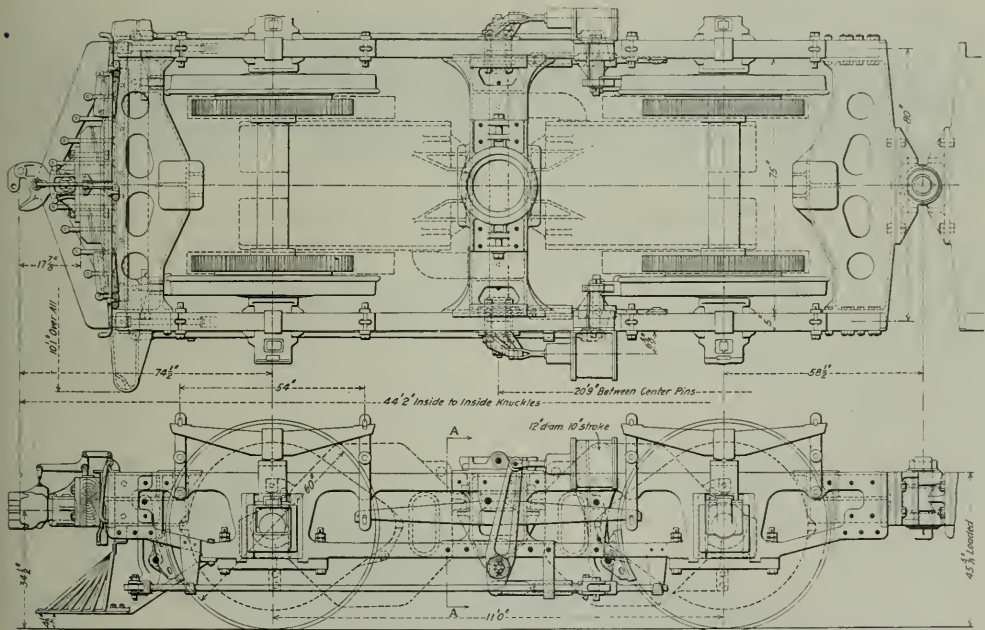
The advantage of this articulated design is that all the draw-bar pull is directed through the truck frames, permitting a much lighter construction of cab platform than in those designs where the pull is directed through the platform sill. Moreover, the only strain which this puts on the center pin is that which is due to the weight of the cab, its equipment and the cab platform. The truck frames are cast steel, those of the front and back trucks being interchangeable. As all the pulling is done through the truck frames, these are made unusually large and heavy. Since on these locomotives it is necessary to add weight in order to obtain the necessary adhesion, account is taken of a part of the weight of the frames and all parts of the truck. Ballast is also used on the cab platform for the same reason. The particular features of the truck construction are shown in the illustration. The method of weight equalization is also of interest. On the No. 1 end truck, the weight on the drivers is carried by semi-



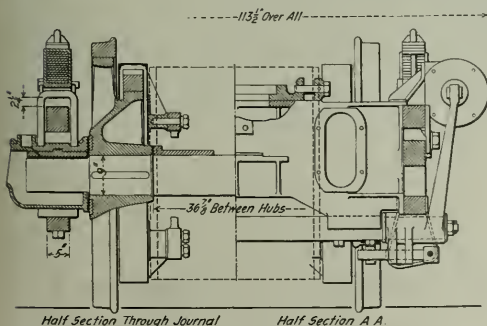
Electric Locomotive Trucks, Showing Pivot Connection.



Electric Locomotive Trucks, Showing Positions of Motors.



Plan and Elevation of Truck; Great Northern Electric Locomotive.



Sections Through Truck.

elliptic springs resting on saddle placed on the top of the journal boxes. The two drivers on each side are equalized together by wrought iron equalizing beams, placed between the upper and lower rails of the frame, similar to the practice in steam locomotive construction. The weight on the drivers of the No. 2 truck is also carried on the same style of springs, supported on the driving boxes in a similar manner, but in this case there is no equalizing beam between the two drivers on one side, but the two front drivers are equalized together by cross beams. The truck bolsters are cast steel, of box construction, with center plates cast integral. These are rigidly connected to the frames. The cab, which carries the controlling apparatus as well as air compressors and other accessories, consists of angle iron framing with a covering of 1/4-in. sheet steel. The arrangement of the car body and end hoods is such as to afford the engine-man a clear view of the track.

These locomotives are now being tried out by a series of

tests under service conditions. At present it is planned to use these locomotives through the Cascade tunnel, which is somewhat less than three miles long, with a uniform grade in one direction of about 1.7 per cent. The following are the principal dimensions of these locomotives:

Total weight	230,000 lbs.
Length over all, inside to inside knuckles.....	44 ft. 2 in.
Length over cab.....	44 " 1 3/4 "
Height over cab.....	14 " "
Width over all.....	10 " "
Total wheel base.....	31 " 9 "
Rigid wheel base.....	11 " "
Gage	4 " 8 1/2 "

STEEL UNDERFRAMES FOR BAGGAGE CARS.

The Burlington is building at its Aurora shops a number of baggage cars with steel underframes to replace those recently burned in Chicago. The underframes were manufactured by the Barney & Smith Car Company, Dayton, Ohio, and are illustrated in the accompanying engravings.

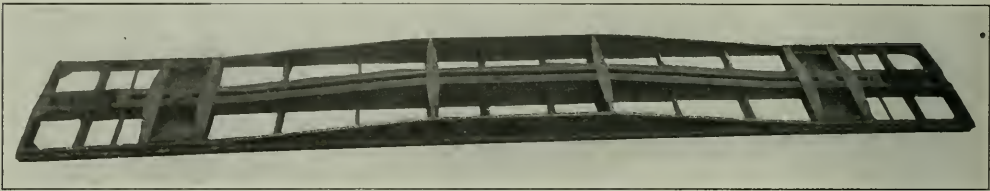
These frames weigh each complete 21,000 lbs. They are 65

The needle beams, two per car, are made of 5/16 in. web plates with 3 x 3 x 5/16 in. top and bottom angles. There are eight channel iron cross ties and eight "Z" bar cross ties, all spaced as shown in the engravings. At all four corners of the car, at center sill and end sills there are 5/16 in. gusset plates reinforcing these points. The center plate is carried on a large steel casting which reinforces the center sills and forms a center arch extending from bolster to bolster.

There are also pressed steel center fillers at each needle beam. Wood nailing strips for the floor will be supported on angle irons which are riveted to the channel iron cross ties.

CAR INTERCHANGE REPORTS.*

Correct interchange reports are the basis of the per diem accounts, and unless we can secure such reports we cannot make prompt and full settlements. If I have not reported all the per diem that is due for the month of July, it is because my reports do not agree with the reports that are



Chicago, Burlington & Quincy Underframe for Baggage Cars, Fig. 1.

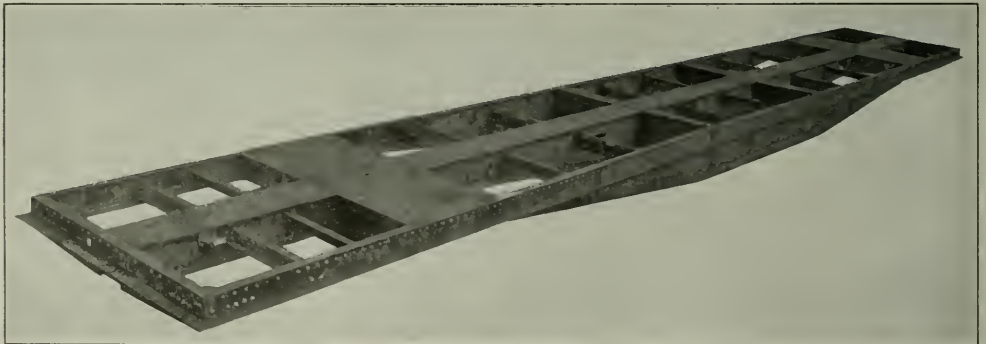
ft. 8 1/2 in. long over all, 9 ft. 8 in. wide and 46 ft. 2 1/2 in. center to center of trucks. They are of fish belly built up sill construction, the web plates being 5/16 in. steel in one piece.

The center girder is 27 1/4 in. deep and has 1/4 in. top cover plate, 3 x 3 x 5/16 in. top outside angles, 4 1/2 x 3 x 7/16 in. bottom outside angles, 3 1/2 x 3 1/2 x 3/4 in. inside bottom angles, all angles and the top cover plate extending the full length of the girder except inside bottom angles, which extend to draft rigging cheek pieces only.

The side sills are 28 in. deep at center, having 3 1/2 x 3 x

made by the agents of connecting lines to their Car Service Departments.

During July, 1908, we recorded the movements of 44,000 foreign per diem cars, and on August 22d, when our per diem reports to owners were ready for mailing, only 133 cars of this number were not properly recorded, so that the full amount of per diem due on each one of them could be reported. Of this number, the records of 129 cars have since been completed, and full per diem has been allowed in subsequent reports. We can therefore claim that, with the ex-



Chicago, Burlington & Quincy Underframe for Baggage Cars, Fig. 2.

5/16 in. top and bottom angles and 4 x 3 1/2 x 5/16 in. angle riveted to the outside of the web plate to support the wood side sills or nailing strips. The end sills are of 14 x 3 1/2 in. steel plates reinforced with angles in the usual manner.

The bolsters are each made up of four 5/16 in. pressed steel fillers—two each being placed back to back—the bolsters being of the double type, that is, spaced 3 ft. 6 in. center to center, and having one large top cover plate 50 in. x 1/4 in. extending between the side sills.

ception of four cars, we have returned full per diem on all foreign cars handled on our line during that month.

The condition of our August records is better still. In that month we handled 46,300 foreign per diem cars, and only 116 of them showed incomplete records when the per diem reports were mailed, and at the present writing we have only 51 of that number on which our records are not com-

*From a paper by W. E. Beecham (C. M. & St. P.) read at Peoria, October 13.